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ABSTRACT

The major purpose of this study was to determine what relationship currently exists between grade 1 marks and later school achievement. Complete academic records were obtained on two samples of students from rural towns in Southwestern Ontario. Each sample contained all the children born between 1964 and 1971 who attended their town's major public elementary school from kindergarten through grade eight, and then completed their secondary education in the town's only public high school. Each student's marks in language arts and mathematics were recorded from final report cards issued in grades one through eight. At the high school level, each student's final grade point average was used as the single measure of overall high school performance. Findings, which were similar to those of research conducted more than two decades ago, indicated that children who experience considerable difficulty in mastering the grade 1 curriculum are likely to have serious learning problems well beyond their early school years. It is concluded that screening at the preschool level for the purpose of identifying children who are likely to have learning problems in grade 1 is clearly justified. (RH)

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Relationship Between Grade One Achievement and Academic Performance through High School

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Legislation requiring school boards to identify failure-prone children prior to school entry exists throughout most of North America. In the United States this legislation is contained in Public Law 94-142 which came into effect in 1975 and was updated in 1986 in the form of Public Law 99-457 (Ysseldyke, Thurlow, and O'Sullivan, 1987). Many Canadian provinces have similar early identification legislation (Karagianis and Nesbit, 1980). Ontario, for example, has Memorandum 15 issued by the Ministry of Education in 1978/79 which was subsequently amended and appears today as part of Bill 82.

Almost from the time it was approved, however, the appropriateness of this legislation has been questioned (Reynolds, 1979). One frequently mentioned concern is whether

it is indeed possible to accurately identify a failure-prone child as early as kindergarten (Adelman, 1982; Keogh and Becker, 1973; Silverman and Davidson, 1984; Wanczycki, 1982). In commenting on Bill 82, for instance, Silverman and Davidson claim that "young children's abilities are simply not sufficiently crystallized at age five...for their functioning at that age to be a useful predictor of performance four or five years later". They make this point because the tests used to screen children in kindergarten, for the most part, have only been validated in predicting school performance through grade one (see Lichtenstein and Ireton, 1984; Mercer, Algozzine, and Trifiletti, 1979; Simner, 1983). Hence, it is not known whether children who perform poorly on these tests continue to exhibit learning problems past grade one or whether, with time, their learning problems disappear. Indeed, others too have suggested that a number of young children who might be considered slow learners either prior to school entry or while in grade one might simply be slow starters (Ames, 1968; Beers and Beers, 1980; Belmont and Belmont, 1976; Keogh and Daley, 1983; Lerner, 1976; Wendt, 1978).

Unfortunately, despite the need for information on the relationship between early school performance and later school achievement, surprisingly little has been reported on this topic. The majority of investigations dealing with the long term stability of academic achievement published prior to 1962 focused mainly on relationships between marks generated at the secondary and post-secondary levels (see Bloom, 1964, for a review of this work). Even more recent investigations in this

area (e.g., Baird, 1985; Butler and McCauley, 1987; Cohen, 1984; Fincher, 1984; Mathiasen, 1984) concentrate largely on scholastic performance well beyond the early primary grades. In fact, the only long term evidence dealing with primary school children that we were able to locate was reported nearly 25 years ago by Hiremath as part of a masters thesis and is summarized by Bloom (1964). In that work, however, Hiremath found correlations in the vicinity of .55 between grade one marks issued by several schools in Chicago and marks obtained at the end of high school. Needless to say, a relationship of this magnitude certainly suggests that children who have difficulty with the grade one curriculum are more likely to receive poorer marks in high school than children who have no difficulty mastering the grade one curriculum.

In view of the many changes that have taken place over the past 25 years in the elementary and secondary school curricula, if correlations similar to those reported by Hiremath can be found today such evidence would clearly support the need to identify preschool children who are likely to have learning problems in grade one. Hence, the major purpose of the present investigation was to determine what relationship now exists between grade one marks and later school achievement.

Subjects

We obtained complete academic records for two samples of students from rural towns in Southwestern Ontario. Sample 1 (56 males and 49 females) came from a town with a population of

4,700. Sample 2 (45 males and 43 females) came from a town of 3,100.

Each sample contained all of the children born between 1964 and 1971 who attended their town's major public elementary school from kindergarten through grade eight and then completed their secondary education in their town's only public high school. Confining our investigation to records obtained by students who started and finished school in the same school system avoided problems in interpreting the relationship between grade one marks and subsequent school performance. If, for example, we had included students who attended private or parochial elementary schools, the differences in the curriculum that normally characterize such schools might have affected the student's marks when they transferred to the public school system. In addition, by confining our samples to children who remained in the same school district, we were able to eliminate the potentially disruptive effects that moving alone can have on children's academic performances (Kraus, 1973).

Two additional points are also worth noting. First, the high schools the students attended offered many of the same courses at both the general and advanced levels of difficulty recommended by the Ministry of Education. Therefore, it was possible for students to select courses at a level suitable to their abilities even in required subjects such as English and Science. Second, according to information on file in the two elementary schools, marks were assigned by a total of 13 teachers during the seven year period in which the students attended grade one. Thus, the results reported below cannot be

attributed to idiosyncratic grading practices used by only a few grade one teachers.

Method

Each student's marks in language arts and mathematics were recorded from the student's report cards at the end of grades one through eight. If a student repeated a grade only the mark earned the first time was used in our analyses.

In grade one the language arts curriculum focused mainly on reading (phonics, oral reading, and reading comprehension) and to a lesser extent, on writing. In the later grades this focus shifted to the development of writing skills which included spelling, grammar, as well as creative writing. The grade one mathematics curriculum concentrated largely on the acquisition of addition and subtraction skills, counting and writing numerals, regrouping and renaming numbers, telling time, and to a lesser extent, on problem solving. In the later grades problem solving became more important along with the development of skills in such areas as multiplication and division.

At the high school level (grades nine through thirteen[1]) the students were required to complete a minimum of 27 credits to graduate. This number had to include 4 credits in English, 2 credits in Mathematics, 1 credit in Science, 1 credit in History, and 1 credit in Geography. The 18 remaining credits could be obtained either by completing further work in the above areas or by taking various elective subjects ranging from Art, Auto Mechanics, and Bookkeeping, to Machine Shop and Physical Education.

Because of the range of subjects available each year in high school it was not possible to select a given set of courses that would be equally applicable as a criterion measure to all students throughout their high school careers. We chose, therefore, to employ each student's final grade point average as a single measure of overall high school performance. This average was calculated by obtaining the student's final mark in all of the required as well as elective courses completed up to the time the student left high school. As was the case at the elementary level, if a student repeated a course in high school only the mark earned the first time the course was taken was used in the analyses. We also recorded the total number of credits earned toward graduation prior to leaving high school as well as noting which students obtained sufficient credits to graduate.

Results

The product moment correlations between the students' grade one marks and the students' subsequent marks in second through eighth grade are reported separately in Table 1 for language arts and mathematics. Also reported in Table 1 are the correlations between the students' grade one marks in these two areas of the curriculum and the total number of high school credits earned toward graduation as well as the students' final high school grade point averages. Although separate correlations were calculated for the males and females in each sample, because no reliable sex differences were found this evidence is not reported.

Place Table 1 about here

As inspection of Table 1 shows, for Sample 1 the correlations in language arts through high school ranged from .52 to .76 and for Sample 2 they went from .59 to .87. In the case of mathematics the correlations extended from .42 to .67 for Sample 1 and for Sample 2 they ranged from .58 to .79. Moreover, in both samples while the correlations are higher for the grades nearest grade one, the correlations are still in the vicinity of .55 even as late as high school. Thus these results are in line with the evidence reported by Hiremath and indicate that individual differences in student achievement in grade one persist though elementary school and remain in effect through high school.

The strength of the relationship between grade one marks and high school performance is further demonstrated in the data reported in Table 2. Here the evidence points to the conclusion that students who received D to F marks in grade one language arts or mathematics, continued to receive failing marks as late as high school and were much less likely to obtain enough credits to graduate from high school than students whose grade one marks were in the B to A+ range[2]. In support of this conclusion, the outcome of a series of one-way ANOVAs applied to the four grade one mark categories shown in Table 2 produced F values for credits earned toward graduation of 12.17 (Sample 1, mathematics: $p < .001$), 14.82 (Sample 1, language arts: $p < .001$), 16.34 (Sample 2, mathematics: $p < .001$) and 13.02

(Sample 2, language arts: $p < .001$). In the case of high school grade point average, the values were 10.45 (Sample 1, mathematics: $p < .001$), 17.87 (Sample 1, language arts: $p < .001$), 33.15 (Sample 2, mathematics: $p < .001$), and 29.03 (Sample 2, language arts: $p < .001$). Moreover, subsequent planned comparisons of the individual means using the Scheffe test confirmed that the comparisons mentioned above were indeed reliable. In fact, the additional evidence also reported in Table 2 dealing with the percentage of students graduating high school shows that, on average, only about 20% of the poorest performing grade one students (those who received D or F marks) graduated in comparison to about 80% of the better performing grade one students (those who received B to A+ marks).

Place Table 2 about here

To further underscore the long term stability in poor performance displayed by students whose grade one marks were at the bottom of the class, Table 3 contains the average final mark in grades one through thirteen for all of the students in Sample 1 and 2 who received an F in language arts and/or mathematics in grade one[3]. As can be seen in this table, with few exceptions, these students continued to receive D or F marks each year.

Place Table 3 about here

It is also worth noting that, according to information in their academic files, 11 of the 13 students listed in Table 3 received special assistance or were referred for testing while in elementary school. Hence, it would appear that these students showed little or no improvement in their academic performances in spite of the additional aid they received before starting high school.

Discussion

The relationship obtained in the present investigation between grade one marks and end of high school performance is very similar to the relationship reported by Hiremath nearly a quarter of a century ago. As such these more recent findings suggest that even today children who experience considerable difficulty mastering the grade one curriculum are likely to have serious learning problems well beyond their early years in school.

While these long term findings need to be replicated of course before generalizations are possible, it is important to note that for the elementary school years, at least, our findings agree with the findings being reported from many other school districts in North America and elsewhere. First, the correlations in Table 1 through grade six are similar to the correlations obtained between scores on a range of academic assessment devices administered in pre-kindergarten, kindergarten, or grade one and scores on various achievement tests given throughout the elementary grades (Badian, 1982; Bruiniks and Mayer, 1979; Butler, Marsh, Sheppard, and Sheppard,

1985; Feshbach, Adelman, and Fuller, 1977; Fletcher and Satz, 1984; Funk, Sturner, and Green, 1986; Klein, 1977; Lindsay, 1980; Perry, Guidubaldi, and Kehle, 1979; Stevenson, Parker, Wilkinson, Hegion, and Fish, 1976; Stevenson and Newman, 1986). Second, there is also considerable evidence showing that the extra help received by poor performing students prior to attending high school in the form of special education classes, individual educational programing, and even grade retention produces little if any lasting improvement in subsequent academic performance (Holmes, 1983; Peterson, DeGracie, and Ayabe, 1987; Satz and Fletcher, 1982; Spreen, 1982). Thus it would seem that at the elementary level, at least, both the stability of academic functioning and the lack of effectiveness of remedial assistance which our findings reveal are not unique to the school systems from which we collected our data.

In essence, although it remains unknown whether the findings we obtained between grade one performance and high school performance will generalize, the similarity between our results at the elementary level and the results reported by others working with primary and elementary school children, by itself, leads us to believe that learning problems in grade one are certainly not transitory. Therefore, we conclude that screening at the preschool level for the purpose of identifying children who are likely to have learning problems in grade one is clearly justified.

While this conclusion is based on the evidence reported above it also should be kept in mind that 75-85% of the children who have serious learning problems in grade one, can now be

identified as early as two years before they even enter grade one (for examples of cost-effective screening procedures see Kunzelmann and Koenig, 1980; Satz and Fletcher, 1982; Simner, 1985, 1987). Furthermore, there now exists a considerable body of evidence documenting the effectiveness of different preschool compensatory education programs. Briefly stated, this evidence shows that placing failure-prone preschool children in a properly designed pre-kindergarten or kindergarten curriculum leads to better performance once these children enter school and that many of the early gains made by these children last through high school and beyond (Casto and Mastropieri, 1986; Goldring and Presbrey, 1986; Schweinhart and Weikart, 1985; Sparrow, Blachman, and Chauncey, 1983). We mention these two final points because we believe they provide additional support for preschool screening by suggesting that if preschool screening programs are implemented in conjunction with properly designed compensatory education programs, preschool screening could have a profound effect on the academic careers of many at-risk children.

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Table 1. Product-moment correlations between grade one marks in language arts and mathematics and marks received in these two areas of curriculum through grade eight. Also reported below are the correlations between grade one marks and the total number of high school credits earned toward graduation as well as the final high school grade point averages obtained.

	language arts		mathematics	
	Sample 1 (N=105)	Sample 2 (N=88)	Sample 1 (N=105)	Sample 2 (N=88)
grade 2	.76***	.87***	.67***	.79***
grade 3	.70***	.84***	.59***	.74***
grade 4	.65***	.79***	.60***	.72***
grade 5	.53***	.77***	.47***	.71***
grade 6	.55***	.67***	.57***	.66***
grade 7	.58***	.77***	.51***	.77***
grade 8	.53***	.74***	.42***	.74***
high school credits earned	.52***	.59***	.48***	.58***
high school grade point average	.53***	.74***	.45***	.70***

***p < .001

Table 2. High school performance as a function of grade one marks in language arts and mathematics

grade one marks	high school performance					
language arts	credits earned toward graduation		grade point average		percentage of students graduating	
	Sample 1	Sample 2	Sample 1	Sample 2	Sample 1	Sample 2
A to A+	29.1	32.0	66.9	71.9	82%	100%
B	24.9	27.6	62.9	66.3	68%	84%
C	20.9	24.3	55.7	57.2	45%	63%
D to F	13.9	18.0	49.0	48.1	5%	35%
mathematics						
A to A+	28.6	32.5	65.7	72.9	82%	100%
B	21.2	27.7	58.6	65.2	47%	84%
C	23.5	23.0	59.6	55.5	56%	64%
D to F	13.3	16.2	48.7	45.8	0%	19%

Table 3. Average final mark in grades one through thirteen for all students in Sample 1 and Sample 2 who failed language arts and/or mathematics in grade one.

	grade												
student number	1	2	3	4	5	6	7	8	9	10	11	12	13
1	D	B	B	D	C	F	D	C	C	C	D		
2	D	D	D	F	D	C	D	D	F	F	F		
3	D	D	D	D	D	D	D	D	D	F	F	F	
4	F	D	D	D	D	D	D	D	F	F	D	F	D
5	D	D	D	D	D	D	D	D	F	F	F		
6	F	D	F	F	D	D	F	D	F	F	F		
7	F	D	C	C	C	C	D	D	D	D	D	D	
8	D	C	C	C	C	C	D	D	F	D	F		
9	F	D	F	D	D	D	D	D	F	D			
10	F	D	D	D	D	D	D	D	F	F	F		
11	F	D	D	D	D	D	D	D	F	F	F		
12	F	D	C	D	D	D	D	D	F	F	F	F	
13	D	D	D	D	D	D	F	F	F	F	F		

Footnotes

[1]A Secondary School Graduation Diploma is awarded in Ontario at the end of grade twelve. Students can remain in high school for one additional year, however, and if they successfully complete six grade thirteen honours level courses they receive an Honour Graduation Diploma.

[2]The grading scheme in the Ontario high school system makes use of the following scale: A+ (90-100%), A (80-89%), B (70-79%), C (60-69%), D (50-59%), F (49% or less).

[3]The missing values in Table 3 resulted from students leaving school prior to completing grade eleven, twelve, or thirteen.